The On-Axis Magnetic Well for Arbitrary Stellarator Geometries PATRICK KIM, University of Maryland, College Park, ROGERIO JORGE, WILLIAM DORLAND, IREAP, University of Maryland, College Park — A simplified analytical form of the on-axis magnetic well in Mercier's criterion for pressure-driven instabilities is derived for stellarators in both vacuum and MHD equilibrium. An analytical result allows for a better understanding and more efficient search of the parameter space for stellarator design. The derivation uses a direct coordinate approach [1] that expresses the toroidal flux surface function in terms of radial distance near the magnetic axis. The flux is expanded in powers of the inverse aspect ratio to fourth order, and the resulting integral is solved over the poloidal angle. This reduces to a one-dimensional integral with respect to the axis arc length parameter that is a function of only the axis shape, as well as the elliptical and triangularity components of the stellarator's cross sections. Finally, this integral is numerically calculated using the Stellarator Equilibrium Near-Axis Code (SENAC) [1], and validated against the magnetic wells for several current stellarator configurations including Wendelstein 7-X. [1] R. Jorge, W. Sengupta, M. Landreman, Journal of Plasma Physics **86** 1, 905860106 (2020)

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